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1. Introduction

The interest in market based instruments as effective, efficient and flexible means to achieve environmental objectives is growing in Europe (see, e.g., EEA, 2005, 2006). The introduction of the greenhouse gas emissions trading system in the EU (Directive 2003/87/EC) can be seen as a landmark and a breakthrough in applying the market mechanism to environmental issues. In the past, the prevailing attitude in Europe was that there is (or should be) no such thing as a 'right to pollute', let alone that such rights could be bought or sold. Nowadays, this view seems to be giving way to the realisation that pollution is an unavoidable side-effect of human activity, and that attaching a price tag to pollution provides a lasting incentive to reduce it at minimum cost to society.

Even though the interest in and experience with tradeable environmental permits and credits is growing, the application of this instrument in the area of water quality is still rather limited (see Oosterhuis and Van der Veeren, 2006). To some extent, this may be related to the persistence of traditional water policy approaches, dominated by technical standards and engineering-based solutions. However, there are also some inherent properties of water quality issues, which limit or complicate the application of tradeable permit systems. In particular, geographical and temporal circumstances matter: the environmental damage caused by discharging one tonne of a certain pollutant at a particular location and time may differ greatly from that of a similar amount at a different place and in an other season. Trading between these two discharges on a 1:1 basis would therefore imply changes in social cost, and thus not be neutral (as it is in the case of greenhouse gases).

The present paper addresses a number of issues in the applicability of tradeable permits to water quality policy in the Netherlands. In chapter 2, the potential advantages and drawbacks of water quality trading are discussed. Chapter 3 deals with various aspects of the design of the instrument. In chapter 4, specific attention is paid to the Water Framework Directive (WFD) and other legislation in relation to the use of tradeable permits. Chapter 5 presents a number of preliminary conclusions.

2. Potential advantages and drawbacks of tradeable permits

2.1 Static efficiency

Trading in entitlements to emit or discharge pollutants provides firms with a choice between reducing their emissions or to buy credits. The economic textbook result is that those polluters who can reduce emissions at relatively low cost will do so and sell their redundant credits, while those who have only expensive reduction options will not take measures and instead will buy credits. In this way, the total cost to society of a given amount of emission reduction is minimised. In principle, the same result can be achieved by imposing an emission or effluent charge (at a rate that is similar to the market price of the credits). However, whereas in a well-functioning system of tradeable permits the total pollution load is (at least in principle) certain in advance[1], such certainty is lacking under a system of charges.

Generally, standards and general rules prescribing the amount of pollution that each individual source is allowed to emit (or the techniques that have to be applied to prevent or reduce pollution) do not give the firm the choice between reducing and paying, and therefore are less efficient than tradeable permits or emission charges. The loss of efficiency that such 'direct regulation' instruments convey is especially large if there are substantial differences between the sources in terms of pollution reduction options and costs. In case of relatively homogeneous sources, the potential static efficiency advantage of economic instruments over direct regulation is less distinct.

2.2 Dynamic efficiency

In addition to pollution control at minimum social cost, tradeable permits also provide a lasting incentive to search for innovative solutions to reduce emissions even further. Companies can make money if they manage to achieve lower emissions: each additional tonne of pollutant avoided enables them to sell a credit. Obviously, this incentive will only exist as long as there is a positive market price for the credits. This will only be the case if the total cap is set at a sufficiently low level.

Standards and other types of direct regulation do not have this built-in innovation incentive. Once compliance with the standard is achieved, a company has no financial interest in reducing emissions further. However, for (potential) suppliers of environmental technology it can still be attractive to invest in the development of cleaner technology, as they may expect that this technology could become the standard for new environmental regulations. In other words, the 'automatic' dynamic efficiency of tradeable permits and other economic instruments can also be achieved by means of a system of standards, which closely follows technological development.

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1 We are talking here about a system with a fixed 'cap' on the total emissions or load of pollutants. Other systems, such as the 'Performance Standard Rate' system (see Section 3.5) do not have this built-in guaranteed ceiling.

2.3 Administrative costs and enforcement

A system of tradeable permits requires reliable techniques and procedures for monitoring and control, both regarding the ‘ownership’ of pollution credits and regarding the actual emissions. Discharges of pollutants represent a financial value and it is in the interest of all parties involved to be sure whether, where and when a pollutant is released. At first sight, therefore, it may seem that the application of tradeable permits involves larger administrative costs than a system of direct regulation. However, in the latter case accurate monitoring is also an essential element of the system: exceedance of the standards implies environmental risks and may lead to the imposition of sanctions on the polluter. For any type of environmental policy instrument to be effective, adequate resources are needed for monitoring and enforcement.

2.4 Functioning of the market and transaction costs

Any market mechanism can only function properly if certain conditions are fulfilled. Markets for pollution are no exception to this rule. One of the main conditions is that all parties involved have sufficient information to enable them to assess the options and attractiveness of trading for themselves. Especially in the early stages of a trading scheme, public support for initiatives that foster such transparency may be necessary. Transaction costs can be reduced by the introduction of (virtual) ‘marketplaces’ and brokering services for pollution credits.

Market power may affect the efficiency of a market negatively. Competition can be stimulated by keeping the threshold for participation low and allowing as many parties to trade as possible (including, for example, NGOs and individuals). Nevertheless, in water quality trading the number of relevant sources within one trading scheme can often be quite limited.

As in other markets, speculation and price volatility are phenomenons that can be encountered on an environmental permit market. Authorities may wish to apply mechanisms and market interventions to achieve some price stability.

3. The design of a tradeable permits scheme

3.1 Introduction

Water quality policy makers who want to reap the benefits from the trading instrument need to know how to design and implement it. The present chapter briefly discusses a number of key elements for the design of a water quality trading system. Obviously, more detailed information will be needed once the plans for such a system become more concrete (which presupposes the existence of a suitable legal framework; see Chapter 4). In that stage, a handbook or guidance document might be a useful tool for the water authorities.[2]

3.2 Pollutants

In principle, all kinds of water pollutants might be suitable for inclusion in a water quality trading scheme. However, in practice only a limited number of pollutants will qualify, due to the inherent characteristics of the trading instrument. There should be a suitable number of sources within the area concerned (otherwise trading would not make sense at all), and there should be some variety in their (marginal) cost of abatement (see Chapter 2). Moreover, the location of the source should have no significant influence on the eventual water quality (unless compensation factors can be applied; see Section 3.3).

In practice, nutrients (nitrogen and phosphorus) are the main substances involved in existing trading schemes. Other pollutants/parameters include sediment, BOD, salinity and temperature. Trading in persistent, toxic and bioaccumulative substances is currently not supported by the US-EPA, but might become acceptable if the trading would lead to substantial reductions (EPA, 2003).

Cross-pollutant trading is an option where different pollutants have an impact on the same water quality parameter. Trading between nutrients (nitrogen and phosphorus) is a case in point. Trading between nutrients and BOD might also be considered if the objective is to improve the oxygen level in the receiving water body. In general, the suitability of cross-pollutant trading will depend on the local situation, and undesirable side effects should be avoided.

3.3 Geographical scope and location factors

As mentioned before, water quality trading differs fundamentally from e.g. greenhouse gas trading in that the in latter system the location of the source does not matter. For water quality, the geographical position of the source is generally very relevant for the environmental impact.

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2 In the United States, the Environmental Protection Agency has prepared such a document. See http://www.epa.gov/owow/watershed/trading/handbook/docs/NationalWQTHandbook_FINAL.pdf.

The boundaries of a water quality trading system will usually not exceed those of the river basin, catchment area or watershed. Often, however, the trading area will be smaller, as the water quality problems may be concentrated in a specific part of the river basin or watershed.

Moreover, the location of the source within the area can strongly affect the eventual water quality impact. For example, a certain amount of pollution discharged in a lake that has little exchange with neigbouring surface waters may cause more environmental harm than the same amount discharged near the mouth of a fast flowing river. These differences can in principle be accounted for by means of correction factors or 'trading ratios'. For example, if the discharge of one tonne of nitrogen in a part A of the trading area is considered to be twice as harmful as in part B, the scheme can include the provision that an increase by one tonne in A should be offset by a reduction of two tonnes in B.

In extreme cases, it might be conceivable that most of the pollution credits are bought by one or a few sources with high marginal abatement costs. This might result in very high pollutant loads at these sources, with disproportionally high environmental damage. In order to avoid such 'hotspots' it may still be necessary to impose (or maintain) an absolute limit on the discharges of individual plants, in addition to the trading scheme.

3.4 'Closed' and 'open' systems

Faeth (2000) distinguishes between 'closed' and 'open' systems of water quality trading with respect to the sources involved. In a 'fully closed' system, all discharge sites in the trading area are controlled under one cap, and this cap equals the total permissible load for the area. A 'partially closed' system is also conceivable, in which for instance point sources have a cap, but non-point sources don't (though the latter may be allowed to 'opt-in' to the system).

'Open' trading systems are usually voluntary and relate to individual sources. They can be used to maintain or improve environmental quality while allowing for economic growth and development. Open systems rely on existing regulations to establish a baseline; reductions from the baseline generate a reduction credit. A typical example of an open system is the establishment or capacity expansion of a sewage water treatment plant, the (unavoidable) effluent of which adds to the total pollution load of a water system. The water authorities may then require the plant to 'offset' this additional load by financing pollution reduction measures at other sources in the same watershed. Obviously, such reductions should go beyond those to which these other sources are already legally obliged.

3.5 Point and non-point sources

Pollution from point sources, such as industrial and municipal waste water treatment plants, is relatively easy to identify and monitor. However, nowadays non-point sources (such as agriculture) are often the main cause of water quality problems. It will therefore usually be desirable to include non-point sources in a system of tradeable water quality permits. This means that methods and procedures are needed to determine the amount of pollutants stemming from these sources, including the reductions in pollutants that can be attributed to the application of specific control measures and (agricultural) management practices. Farmers and other 'non-point source operators' should not be left in doubt about the conditions for receiving credits. In practice, this will often mean that they just have to show that they have taken certain measures or adopted certain practices, without the need to show that this has actually led to the calculated associated reduction in pollution load. The uncertainty involved in this approach can be accounted for by applying a 'trading ratio' (implying that 1 tonne of a pollutant at a point source should be offset by a reduction at the non-point source by more than 1 tonne).

3.6 Allocation mechanisms

Basically, there are two ways for the (initial) allocation of pollution credits or permits to individual sources. Under a 'cap-and-trade' (CAT) system, the total amount of allowable emissions or discharges in the area is determined beforehand, and this amount is divided among the participating sources. Under a 'performance standard rate' (PSR) system the credits for each source are related to some parameter (for example, grams of BOD per unit of production volume).

In the CAT system, the permits can either be sold (auctioned) or granted (grandfathered). Auctioning is generally seen as the most efficient solution. However, it may involve a substantial money transfer from the polluters to the authorities. In order to mitigate this impact, the revenues of the auction could be recycled to the polluters, but this requires some 'neutral' distributive code. On the other hand, grandfathering also requires an objective distributive code. Generally, the historical emissions in one or more base years are used. This may be at the disadvantage of those sources which have taken early measures for emission abatement, or which experienced special circumstances (e.g. low production volume due to maintenance or repair) in the base years. Moreover, grandfathering implies a 'windfall profit' for those firms that can pass on the (opportunity) costs of the permits/credits in their product prices.

The PSR system differs fundamentally from the CAT system, as under PSR there is no certainty about the ceiling on the total amount of pollutants. A PSR scheme requires a polluter to buy (additional) credits if his emissions exceed the predetermined standard, and allows him to sell if he performs better than the standard. Industry is often in favour of a PSR system, because it leaves them room for growth without having to buy additional credits.

3.7 Time aspects

The factor time plays a crucial role in the design of a tradeable permit system. Environmental policy usually aims at continuous decreases in pollution loads, towards some long term objective. This implies that the 'cap' in a cap-and-trade system will become lower in the course of time. The scarcity of credits will increase, even though this does not necessarily imply higher prices (as low-cost abatement options may become available).

Depending on the allocation mechanism, the need to lower the cap over time can be dealt with in different ways. Under a CAT scheme with auctioning and time-limited validity of the credits (e.g. one year) a new auction can be organised yearly. A less costly approach is to auction credits for several years at once, with a lower total amount for each subsequent year. These two options can also be applied under a grandfathering system, but here the base year(s) will have to be determined anew every time (leaving room for strategic behaviour by the polluters). In a PSR system, the standard (benchmark) can simply be tightened over time.

A key question is whether intertemporal trade should be possible, i.e. whether unused credits can be 'banked' for usage in future years (or even 'borrowed' from future years). Banking clearly enhances the flexibility of the system, but it may frustrate the objective of continuous environmental improvement. The risk of speculative behaviour may also increase. Probably, authorities will allow banking only under certain restrictions and within limits.

For water quality trading, seasonal variations will play an important role as well. The discharge of a certain amount of pollutants in a dry period with low water levels may be much more harmful than the same amount in a rainy season when water levels are high. A trading system could allow for such differences by applying a seasonal 'trading ratio', similar to the ratios for location and for non-point source uncertainty mentioned in preceding sections.

4. Tradeable permits, the WFD and other legislation

4.1 Water quality trading and EU legislation

Article 10 of the Water Framework Directive (WFD) requires Member States to ensure (by 2012 at the latest) the establishment and/or implementation of emission controls based on best available techniques (BAT), emission limit values, or (in the case of diffuse impacts) best environmental practices. For the content of these requirements the WFD refers to other EU legislation, including the Integrated Pollution Prevention and Control Directive (IPPC, 96/61), the Urban Waste-water Treatment Directive (91/271) and the Nitrates Directive (91/676). Where a quality objective or quality standard requires stricter conditions than those, which would result from the application of these controls, more stringent emission controls should be set accordingly.

This 'combined approach' of source based and water quality based requirements seems to leave limited room for water quality trading. After all, each and every individual source has to comply with rather stringent BAT or comparable standards. Allowing sources to exceed the standards in exchange for buying credits from 'overperforming' sources would only be possible if the WFD and the other relevant EU laws were changed. This is what has been done in the case of the EU greenhouse gas emissions trading system (Directive 2003/87): the IPPC Directive was amended so as to exclude emission limit values for greenhouse gases in permits for installations participating in emissions trading. Obviously, similar changes for water quality trading will only be feasible if such trading were to be introduced on an EU wide scale, or at least in a substantial number of Member States.

Meanwhile, the trading instrument will probably remain limited to 'fill the gap' between the water quality that can be achieved with the source-related requirements (BAT etcetera) and the quality that is required by the WFD or other legislation. This reduces the scope for trading, but the remaining space may still be important, as it concerns the 'right hand part' of the cost-effectiveness curves, where marginal costs per unit of pollution reduction are high and differences between sources may be relatively large.

4.2 Dutch legislation and institutions

Emissions trading for greenhouse gases and for NO_x is covered by Chapter 16 of the Dutch Environmental Management Act (Wet milieubeheer). For water quality trading, a comparable chapter could be added to the Act on Surface Water Pollution (Wet verontreiniging oppervlaktewateren).

The Dutch Emission Authority (Nederlandse Emissieautoriteit, NEa) could be charged with the task of registration, monitoring and enforcement of a water quality trading system. NEa performs these tasks already for the existing CO_2 and NO_x trading systems. Presumably, some issues of coordination and competence will have to be sorted out between the Ministries of Water (V&W) and Environment (VROM).

5. Conclusions

The interest in emissions trading (and other market based instruments of environmental policy) is growing. However, the application of this instrument in the area of water quality is still rather limited. In this paper, we have addressed a number of issues relating to the applicability of tradeable permits to water quality policy in the Netherlands.

Emissions trading has important potential advantages over (uniform) source based standards. It provides 'static efficiency' by stimulating pollution abatement at sources with the lowest marginal costs. Moreover, it provides 'dynamic efficiency' by giving a lasting incentive to search for innovative, more cost-effective pollution reduction options. To enable a trading system to live up to these promises, the policy maker should create circumstances in which the market can function smoothly (e.g., market transparency), and ensure that adequate rules, monitoring and enforcement systems are in place.

A well-functioning water quality trading system calls for a careful design. Key elements in this design include:

- The pollutants to be included (nutrients being among the main candidates);
- The geographical scope of the scheme (e.g. river basin, catchment area, or part of it);
- Provisions that take into account the differences in environmental damage that may result from one unit of pollution (depending on e.g. time and place of discharge), possibly by applying 'trading ratios';
- The comprehensiveness of the system in terms of sources involved ('closed' or 'open' system);
- Methods and procedures to determine the amount of pollutants stemming from non-point sources, including the reductions in pollutants that can be attributed to the application of specific control measures and (agricultural) management practices;
- The allocation mechanism (grandfathered or auctioned cap-and trade; or performance standard rate);
- The duration of the permits' validity and the possible inclusion of a 'banking' option.

For the time being, water quality trading seems to be especially suitable to 'fill the gap' between the water quality that can be achieved with the source-related requirements of the Water Framework Directive (WFD) and the eventual quality that is also required by the WFD and other legislation.

References

EEA (2005). *Market-based instruments for environmental policy in Europe.* EEA Technical report no. 8/2005. European Environment Agency, Copenhagen.

EEA (2006). *Using the market for cost-effective environmental policy. Market-based instruments in Europe.* EEA Report no. 1/2006. European Environment Agency, Copenhagen.

EPA (2003). *Water Quality Trading Policy.* United States Environmental Protection Agency, Office of Water, January 13, 2003. http://www.epa.gov/owow/watershed/trading/finalpolicy2003.pdf

Faeth, P. (2000). *Fertile Ground: Nutrient Trading's Potential to Cost-effectively Improve Water Quality.* World Resources Institute, Washington DC.

OECD (2004). *Tradeable Permits, Policy Evaluation, Design and Reform*. Organisation for Economic Co-operation and Development, Paris.

Oosterhuis, F. & Veeren, R. van der (2006). *Ervaringen met verhandelbare rechten in het waterkwaliteitsbeleid van de Verenigde Staten.*. Working paper W-06/29, IVM-VU, Amsterdam, March 2006.